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Determination of the free volume and mobility of polymer chains in highly-permeable glassy polymers by the conformational probe method

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Abstract

The behavior of probes with different sizes (1,2-bromofluoroethane, 1,2-dichloroethane, methyl dichlorophosphate, 1,1,2,2-tetrabromoethane, 1,2-di-p-bromophenylethane) was investigated in poly(methyl methacrylate) and poly(vinyl acetate). It was revealed that there is a linear correlation between the freezing temperatures of conformational transitions in probe molecules and the sizes of rotating probe fragments. The results obtained were used in analyzing the processes responsible for the freezing of conformational equilibria of probes in polymers as temperature decreases. The free-volume distribution in glassy polymers, such as poly(vinyltrimethylsilane) and poly(trimethylsilylpropyne), was studied using the conformational probe method.